Space Weather Technical Forecast

Issued on Saturday, 31 August 2024 at 01:19 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: G1 Minor Storms easing early day 1 (31 Aug). M-class flares likely.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with peak M3.8 at 30/1220 UTC from AR3806 in the southwest. This is the largest of the nine regions currently on the Earth-facing disc, and has seen some slow growth along with the emergence of small spots around its periphery. The only other region of note is AR3807 in the south-centre disc, which has rapidly developed in the last 36 hours, but is maturing into a simple bipolar group. The other region remain simpler, with the majority small and decaying unipolar groups.

No Earth directed CMEs have been observed.

Solar Wind / Geomagnetic Activity: The CME influence from 27 Aug quickly transitioned into an enhancement from the weak fast wind of CH62, delineated by a solar sector boundary (SSB) crossing at 30/0740 UTC. Solar wind speeds, as measured by ACE at L1, varied from 350-400km/s, with density near or below average. The Interplanetary Magnetic Field, Bt, was initially strong at 13-20nT, but declined to 12-17nT around 30/0730 UTC, before gradually easing to be moderate at around 10nT by the end of the period. The north-south component, Bz, was initially strongly positive, peaking +20nT, but then sharply switched to be moderately negative at 30/0730 UTC, before quickly reaching a minimum of -14nT. The Bz component then persisted largely at moderate negative values. Phi angle was initially negative (towards the Sun), before turning positive (away from the Sun) from 30/0740UTC. Geomagnetic was initially Quiet to Unsettled (Kp1-3), but increased to be Active to G1 Minor Storm from 30/0900 UTC. BGS reported G1 intervals for 31/1800-2100 UTC and 31/2100-2400 UTC

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES18 remained at background. High energy electron flux (greater than 2MeV) observed at GOES16 was at background. The 24-hour fluence was below the Active threshold, with 1.12e6 integrated pfu observed at 31/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity with M-class flares likely and a slight chance of isolated X-flares. The main flare risk is currently from AR3706.

Solar Wind /Geomagnetic Activity: There are no Earth-directed CMEs. Current weak high speed stream is expected to ease early on day 1 (31 Aug), with the next fast wind arrival anticipated on day 3 (02 Sep), although this is low confidence. Any enhancement from this feature is currently expected to be limited, with solar winds soon easing day 4 (03 Sep). Active to G1 Minor Storms remain possible early day 1, but soon easing to mainly Quiet with isolated Unsettled spells thereafter. There is a chance of and Unsettled to Active spell on day 3 from any onset of any fast wind.

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain at background, with only a very slight chance of reaching the S1 Minor Radiation Storm level. High energy electron flux is expected to remain at background, but with a chance of rising to

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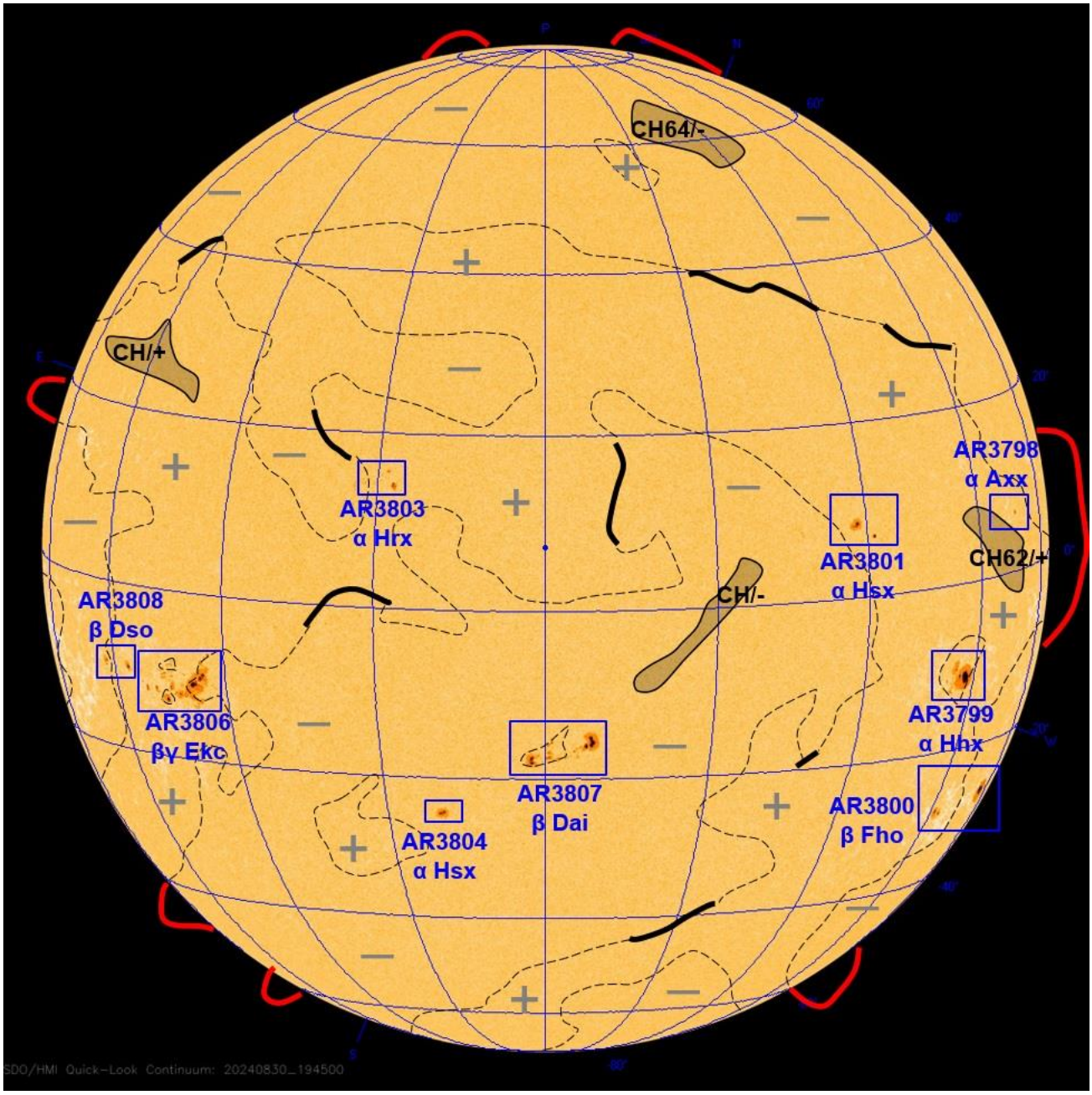
Moderate at times during diurnal maximum. The associated 24-hour fluence is expected to persist below Active.

Figure 1. Solar Analysis Valid 30/2000 UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs.

Solar winds are at background speeds, but with a moderately southward IMF after the onset of the fast wind from CH62/+. This should soon ease, but does bring a chance of Active intervals early on day 1 (31 Aug). The next enhancement is expected from the narrow central disc coronal hole. Any notable enhancement is low confidence, due to its small size, lack of persistence and unfavoured polarity for the time of year. MOSWOC Enlil is also overestimating an enhancement on the 01 Sep, suggesting a strong and broad coronal hole fast wind connection that is not expected.

Mainly Quiet activity is expected with Unsettled intervals, once any initial enhancement eases on day 1. There is a chance of and Unsettled to Active spell on day 3 from any onset of the narrow coronal hole

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	30	1	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2a: BGS Estimated Kp

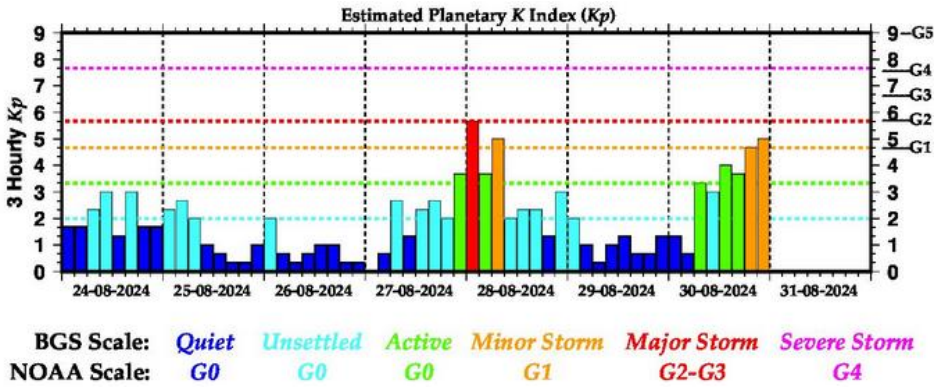

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Figure 2b: ACE Solar winds, showing clear SSB and prolonged negative Bz

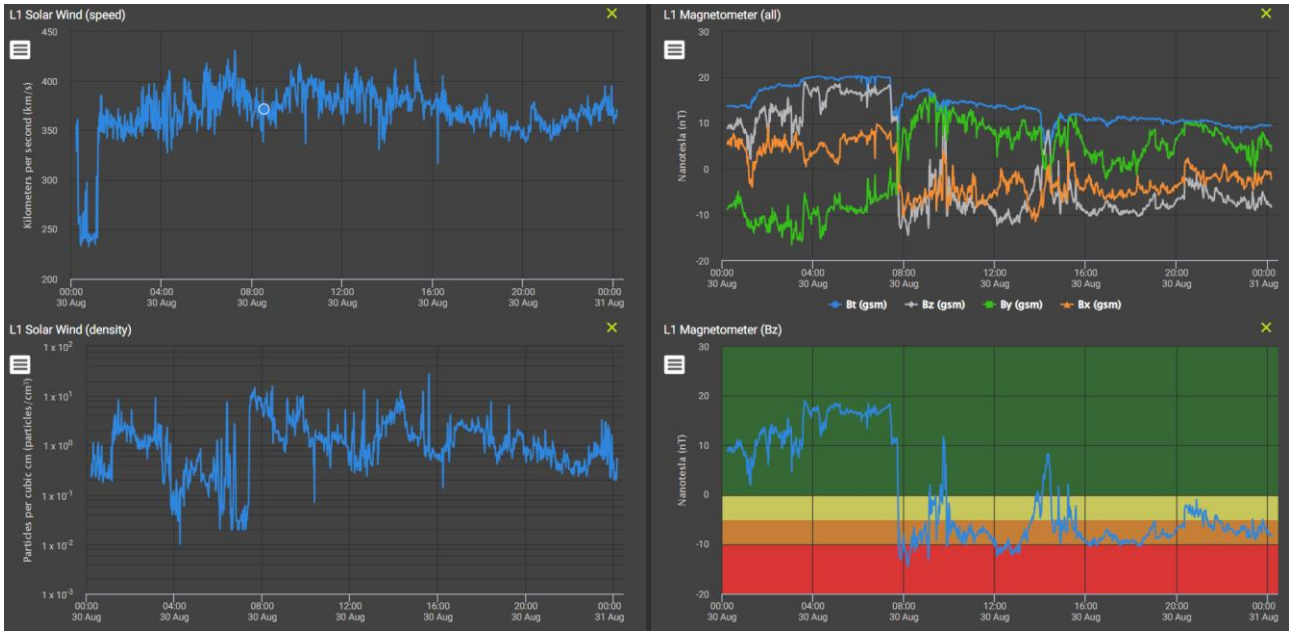
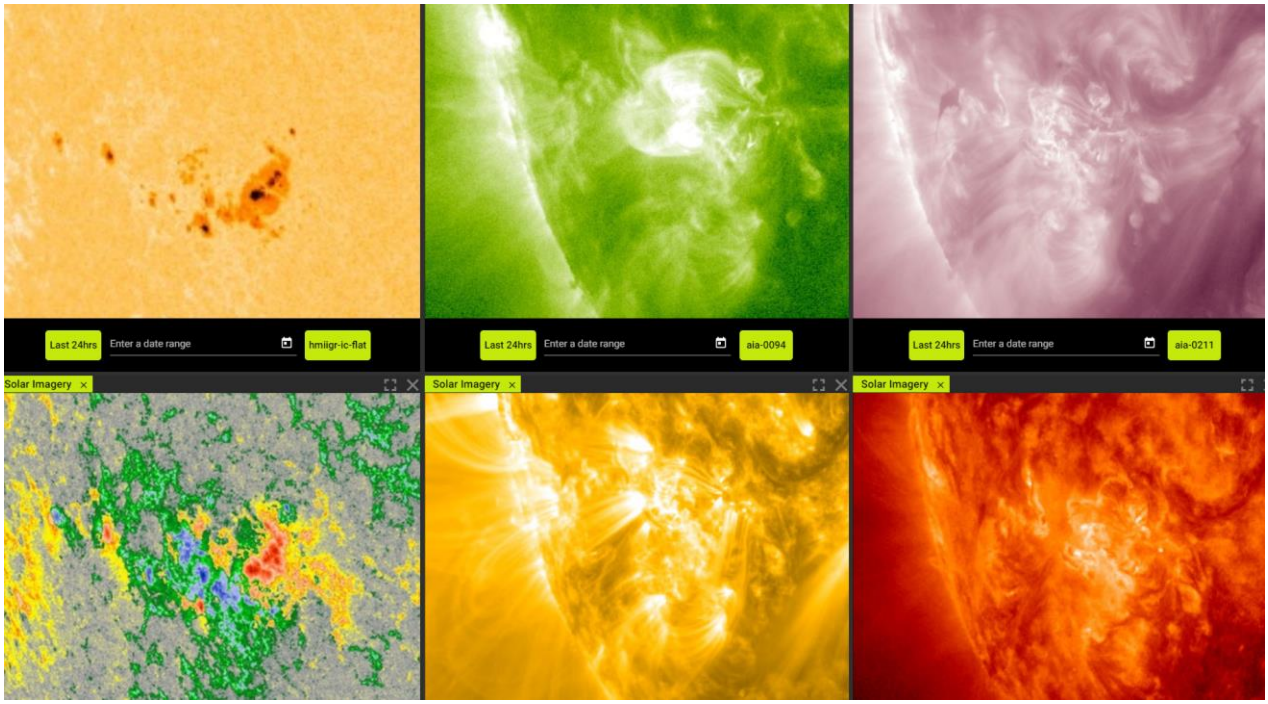


Figure 3a: SDO imagery of AR3806 on the southwest limb



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Radio Blackouts - X-Ray Flares:

Moderate activity is likely with a slight chance of rising to High.

There are nine sunspot regions on the Earth-facing disc. The largest region is AR3806 in the southeast disc. This is a relatively ragged but developing region, set within a region of plage and with more details also becoming apparent as this moves into a less oblique viewing angle. Ongoing growth is likely, with recent emergence of peripheral spots, along with increasing complexity also possible.

The other region of note is AR3807 in the south-centre. This is a rapidly developing region, only emerging in the last 36 hours, but appears to be maturing into a simple bipolar group. The other regions are generally simpler, with many of these small decaying unipolar spots. However further regions have the potential to rotate onto the disc, including from over the southeast limb, where bright magnetic looping remains evident in SDO imagery.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X Class	No	10	10	10	10

Figure 3b: GOES 16/18 X-ray flux

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Solar Radiation Storms - (High Energy Protons):

High energy proton flux, as observed by GOES-18, is expected to persist at background with only a slight chance of rising in response to any notable flares. While there are a few sunspot regions on the western disc, which is the better connected region of the Sun to give the potential for observable protons at GEO, these are generally simple and relatively small.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux as observed by GOES-16 is currently at background. Recent enhancements, including the CME arrival on 27 Aug and the fast wind arrival on 30 Aug have potentially increased electron counts at lower orbits. It is uncertain how much these will expand outwards to be observed at GEO, however periods of Moderate flux remain possible during diurnal maximum.

Despite the potential for any increased flux, the associated 24 hour Fluence is expected to remain below the Active (1e8 integrated pfu) threshold throughout, although a slight rising trend is likely. MOSWOC REFM is providing good guidance for staying below this level, but likely underestimating any potential rising trend.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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